Review

The Royal Society of Medicine

Journal of the Royal Society of Medicine; 2015, Vol. 108(10) 390–395
DOI: 10.1177/0141076815603234

Climate change, conflict and health

Devin C Bowles[1], Colin D Butler[1,2] and Neil Morisetti[3]

[1]National Centre for Epidemiology and Population Health, Australian National University, Canberra, ACT 0200, Australia
[2]Faculty of Health, University of Canberra, Bruce ACT 2617, Australia
[3]Department of Science, Technology, Engineering and Public Policy, University College London, London, WC1E 6BT, UK
Corresponding author: Devin C Bowles. Email: devin.bowles@anu.edu.au

Summary

Future climate change is predicted to diminish essential natural resource availability in many regions and perhaps globally. The resulting scarcity of water, food and livelihoods could lead to increasingly desperate populations that challenge governments, enhancing the risk of intra- and interstate conflict. Defence establishments and some political scientists view climate change as a potential threat to peace. While the medical literature increasingly recognises climate change as a fundamental health risk, the dimension of climate change-associated conflict has so far received little attention, despite its profound health implications. Many analysts link climate change with a heightened risk of conflict via causal pathways which involve diminishing or changing resource availability. Plausible consequences include: increased frequency of civil conflict in developing countries; terrorism, asymmetric warfare, state failure; and major regional conflicts. The medical understanding of these threats is inadequate, given the scale of health implications. The medical and public health communities have often been reluctant to interpret conflict as a health issue. However, at times, medical workers have proven powerful and effective peace advocates, most notably with regard to nuclear disarmament. The public is more motivated to mitigate climate change when it is framed as a health issue. Improved medical understanding of the association between climate change and conflict could strengthen mitigation efforts and increase cooperation to cope with the climate change that is now inevitable.

Keywords

climate change, conflict, public health, Syria, security, Mali, Darfur, future health, IPPNW, military-academic collaboration

Introduction

Climate change has been described as the greatest global health threat of the century,[1] yet its probable direct impact on mortality and morbidity via mechanisms such as increased heatwaves and altered infectious diseases epidemiology is likely to be modest.[2] If the threat climate change poses to world health is as great as many researchers anticipate, then its indirect pathways are likely to be most important. These include pressure on health determinants such as agricultural production, food prices and the risk of violent conflict; all of which pose a challenge to geopolitical stability, a prerequisite for sustained economic prosperity and wellbeing.

Threats from climate change to health have long been recognised. The possibility that conflict fuelled by climate change would be an important causal pathway was identified in the health literature over two decades ago and has occasionally since surfaced, including as the focus of a conference run by MedAct in London in 1994. Yet, the attention given to this issue, compared to most other health-related dimensions of climate change, has been unduly sparse, considering the immense potential for harm to health, which large-scale climate-related conflict may inflict.

Outside the health literature, however, the risk that climate change will enhance conflict is receiving increasing attention, particularly in work by political and other social scientists.[3–5] Special issues of academic journals, including *Political Geography* and the *Journal of Peace Research* illustrate this. But, the health literature has been slow to react, perhaps reflecting a wider reticence to engage with the topic of violence and conflict, though exceptions exist.[6,7]

An important dimension to this has been an attempt by some of the global military who not only recognise the threat to human security that climate change appears to pose, but have actively reached out to civil society, including to health workers, in an appeal to defuse these risks.[8,9] Gradually, some health workers and health journals have responded.[10,11]

Methods

The authors undertook a systematic review of the health literature dealing with climate change-associated conflict. A search for the terms (climate change OR global warming) AND (conflict OR war OR violence OR social thresholds) AND (health

or med*) in any field on PubMed was conducted. The search was limited to articles in English. Additionally, three health journals were systematically searched for relevant articles. *Medicine, Conflict and Survival* and *Conflict and Health* were searched by entering the terms 'climate' and 'warming' into the journal's search engine. Titles of articles were manually reviewed for relevance to the topic. Titles of articles in *Medicine & Global Survival* were manually surveyed to determine topical relevance. Additionally, the authors drew on their knowledge of academic publications on climate change and conflict outside of the health literature.

Causal pathways linking climate change, conflict and health

Most analysts of this topic conclude that climate change increases the chance of conflict, particularly over shrinking resources. Probably the most common conceptualisation of climate change is that it is a 'risk multiplier' for conflict, a framework initially popularised by The German Advisory Council on Global Change.[12] Causal pathways span a continuum in how directly they operate to increase the risk of conflict. Decreased availability of essential resources could directly increase the probability of violence. Diminished arable land or available water could lead to conflict between ethnic groups or between nations. Somewhat less directly, countries may respond to water shortages by building dams or contravening water treaties, which may provoke conflict, including through attacks on water infrastructure by downstream countries. Such a lack of resources is unlikely to cause conflict when political relations are otherwise positive, but could heighten pre-existing tensions between neighbours and help tip them into conflict.

Less directly, reduced or redistributed availability of natural resources resulting from climate change will have a range of socio-political consequences, some of which enhance conflict risk. In much of sub-Saharan Africa and parts of South Asia, climate change could contribute to economic recession, high unemployment and food insecurity. The predicted increased frequency and intensity of extreme weather events may test or rupture social fabrics and resilience. The risk of civil strife, terrorism and even revolution is enhanced as state capacity to provide public goods declines.[13,14] As governments become less able to meet the basic needs of their citizens, including security, citizens may look to other groups to meet these needs. This is particularly dangerous in countries with pronounced ethnic or religious differences, as ethnic and other in-groups may come to replace governments as guarantors of security.[14] Additionally, as conditions deteriorate due to scarcity, the opportunity cost of participating in crime, terrorism or rebellion is diminished, enhancing its appeal. This creates a reinforcing feedback loop, as such incentives further undermine the state's ability to protect its citizens.[14] Scarcity also can provide incentives and opportunity for leaders to distract from structural problems and consolidate power. Aggravating ethnic and other social divisions and the use of violence are among the techniques employed for this purpose.[14] Since so many of the indirect causal pathways have decreased state capacity as a necessary step, the risks of conflict from climate change will be greatest where governance and civil institutions are already weak, at least initially.

Eventually, climate change could jeopardise security over entire regions or even globally, as several defence establishments already recognise, including in Britain and the US.[15,16] Additionally, climate change could destabilise supply chains and access to raw materials and markets, enhancing the risk of instability at a range of scales. Economic weakness can also threaten human and traditional security.

Supporters of a more limited causal framework, applied to other areas of public health and epidemiology, have been characterised as 'prisoners of the proximate'.[17] Supporters of such restricted causal fields generally point solely to political and other social elements as the 'true' causes of conflict. However, to separate these factors from their underpinning ecological determinants is as short-sighted as a health analyst, who attributes ischaemic heart disease solely to arterial blockage. Limited causal frameworks also inhibit the identification of more fundamental remedies, be they to reduce poverty, improve soil fertility, ameliorate climatic conditions or lower the burden of heart disease.

The influence of climate change on how conflict is waged and its duration

While a great deal of attention has been devoted to determining whether climate change will increase the risk of conflict onset, there has been little study of whether climate change will affect how conflicts are fought or how long they last. Importantly, climate change could alter these two characteristics even for conflicts it does not itself precipitate. Climate change may have contributed to the conflicts in Syria and Darfur, Sudan, as detailed below. These events may herald the way conflicts exacerbated by climate change will be waged in developing countries: proliferating arms, targeting of civilians, recruitment of

paramilitaries and the multiplication of militias. Not all conflicts will have all of these characteristics, but climate change could increase their likelihood.

Without sufficient mitigation, climate change will reduce the pool of available necessary resources beyond the required minimum for the sustenance of some regional populations. This situation makes civilians more likely to be targeted. When fighting breaks out in these conditions, a purely political victory, such as the surrender of one side, will be inadequate because it will not address the fundamental population/resource imbalance. This problem has two possible solutions. Additional resources can be brought in from other areas, especially in the form of humanitarian aid. This aid is most likely to flow in cases of humanitarian emergencies, which perversely may provide fighters with an incentive to target civilians. The second solution is to decrease the regional population, either through mass slaughter or enforced flight; killing civilians contributes to each of these goals. Each of these elements inhibits the achievement and maintenance of peace and stability.

As detailed above, climate change will likely weaken some governments, potentially undermining their monopoly on violence. In such a situation, people look to other groups to guarantee their safety, and this can take the form of ethnic militias or other types of paramilitary groups. People may seek to arm themselves, expanding the number of weapons in an area.

Similarly, climate change may help conflict persist. Conditions of drought, food insecurity and the inability of newly urban families to live off the land impede peace efforts, regardless of government. The difficulty of brokering peace under these conditions is highlighted by persistent conflict in Sudan and Syria, and regime change and lasting violence in Egypt following democratic elections. The possible effects of climate change, including a diminution of the 'long rains' in the Horn of Africa,[18] could also contribute to Somalia's persistent state failure. Climate change may thus be a 'peace inhibiter' as well as a 'threat multiplier'.

Public health and conflict

Conflict is detrimental to health in many ways, at individual, community and population levels. These harms arise from the direct effects of violence, including against non-combatants and additional strain upon health systems.[11,19] Conflict also creates conditions conducive to infectious diseases, including through poor nutrition, mass migration, overcrowding, and decreased access to clean water, sanitation and shelter.[6] Prevention and control programmes of infectious disease can be diminished or abandoned, potentially hindering some disease eradication efforts.[6] Destruction of infrastructure, death and flight of health personnel and damage to other social determinants of health may be difficult to ameliorate except in the very long term.[6]

The psychological impacts of conflict, including post-traumatic stress disorder and depression, affect fighters and civilians, and can continue for decades. Conflict increases exposure to traumatic events such as the death of loved ones and the destruction of homes.[20] It also degrades ongoing social and physical conditions through daily stressors including community strife, malnutrition and overcrowding.[20,21] These stressors can extend well beyond the period of conflict, including for refugees adapting to new cultures and oppressed minorities in post-conflict zones.[20] Psychological trauma is culturally interpreted and social support is an important protective factor. Conflict and acts of terror often deliberately erode the social fabric, and with it a society's capacity to help people make sense of physical trauma and social loss.[21]

The public health literature and conflict

Conflict, responsible for substantial mortality and morbidity worldwide, receives surprisingly little attention in the health literature, with a few major exceptions[22] and a handful of highly specialised journals. Academic self-censorship may contribute to this quiescence. Some argue against 'securitising' environmental issues, including climate change. Proponents of this view fear that making these links more explicit may lead to a self-fulfilling prophecy, leading to military bandaids instead of ecological vaccines.[23] However, many defence sectors already conceptualise climate change as a 'threat multiplier'. Academic isolation from these debates is unhelpful, not only by denying these debates the insight that civilian thinkers can add, but also by hindering alliances between civil society and the military that might nurture the development of conflict-lowering understanding of 'determinants of security'.[24]

Contemporary examples of climate change and conflict

Climate change may have already contributed to a number of civil conflicts. Hsiang et al. contend that El Niño events bring hotter and drier weather to much of the tropics and therefore could provide a model of future climate change. Examining the tropics between 1950 and 2001, they found that civil

conflicts were twice as likely to commence in El Niño years as in cooler, wetter La Niña years. They estimate that El Niño may have contributed to 21% of civil conflicts during this period.[3]

The conflict in Darfur has often been linked to climate change. Some argue that it multiplied pre-existing tensions between farming villagers and pastoralists as rainfall and vegetation declined.[13,25] The government used these tensions to foment conflict and bolster its support among the ethnic groups it favoured and assisted in the conflict. This conflict was marked by a high level of violence directed at civilians, with reports of wells being poisoned.[25]

Climate change may have helped precipitate the Arab Spring.[26] World wheat prices more than doubled in 2010 due to extreme climatic events in the breadbasket nations of Russia, Ukraine and Canada.[26] Many Arab countries were vulnerable to the effects of this due to their low incomes and reliance on imported wheat. Governments became less able to meet their citizens' needs and appeared less legitimate. This likely contributed to the wave of rebellions and revolutions across the region.

The civil war in Syria may have also been precipitated by its severe half-decade drought, in turn plausibly worsened by climate change, multiplying underlying risks of government corruption, natural resource mismanagement and high population growth.[5,27] Climate modelling suggests that the severity of the drought was at least partially caused by climate change.[5] The drought devastated Syria's economy. The effects of the drought were amplified by previous government policies, which left Syria economically reliant on agriculture, including unsustainable dependence on groundwater withdrawals which exceed recharge.[5,27] The drought caused crop failures over multiple years, and by 2011, 2–3 million farmers and pastoralists were affected. One million people became food insecure,[27] due to a combination of pressures, including decreased agricultural production worldwide, substantially diminished local production of wheat, barley and livestock, and the cessation of government subsidies.[5,27] Syria's cities had already experienced an influx of refugees from Iraq in the years immediately prior,[5] but the drought and its effects caused 1.5 million Syrians to move to cities and their outskirts.[27] Conditions of poverty and corruption prevailed, with the government unwilling or unable to alleviate the suffering of its people. This situation proved a fertile breeding ground for discontent, which started in Syria's cities.[5]

In Mali, intermittent drought since the 1960s, food insecurity and a sense of being marginalised have contributed to radicalisation of nomadic Tuareg, some of whom served as mercenaries for defeated Libyan President Gaddafi, and who returned from that conflict with more weapons and new fighting skills.[28] Ecological stress was worsened by a history of recurrent drought,[29] including one that was particularly severe starting in 2009. In 2012, the most recent armed Tuareg rebellion precipitated a coup against the democratic government, in turn facilitating takeover of much of the country by jihadist extremists until French intervention.[29] This crisis threatened peace and stability in the region. Islamic militants who fought in Mali have links with Algeria, Niger (with its own potentially radicalisable Tuareg community) and perhaps in Nigeria, which is currently engaged in its own conflict against Islamic insurgents, including Boko Haram, which may have received training from Islamic extremists in Mali.[29]

Scenarios for future climate change and conflict

Unmitigated climate change is widely predicted to decrease the availability of vital resources, including water, arable land and food. Equatorial countries will be among those hardest hit, with agricultural production and food security likely to worsen across much of the tropics.[11] Impacts may be greatest in areas where agriculture accounts for most economic activity and livelihoods.

Sub-Saharan Africa contains many of the top 30 weak, fragile or failing states, with a particular concentration in the Sahel.[13] Many of these states are vulnerable to climate change, making them likely hotspots for future associated conflict. Iraq, Afghanistan and Pakistan similarly face risks from both state and climate vulnerability.[13] Climate change may also disrupt the South-Asian monsoon, causing crop failures in South Asia, and shrinking Himalayan glaciers from which spring major rivers. Especially vulnerable is the Indus, vital for health and security in nuclear-armed Pakistan. This could lead to creative contraventions of the treaty governing water-sharing between India and its neighbour, straining already tense relations.

Climate change is already increasing energy and mineral accessibility in the Arctic, including in disputed areas of its seabed. Competition over these resources has intensified.[4] However, while miscalculation could precipitate accidental war, the odds of armed conflict in the Arctic appear low. Nevertheless, three potential contestants (Russia, China and the US) have nuclear weapons.

Reducing the risk of climate change-associated conflict

Effective adaptation to climate change is increasingly necessary, but should be facilitated by stronger efforts to mitigate climate change. Energy, economic and cultural systems need to evolve if they are going to deliver substantial near-term ancillary health benefits to populations undertaking such mitigation actions. For example, decreased reliance on cars will increase active transport, and social interaction. Replacing fossil fuels with less polluting forms of energy will decrease the burden of non-communicable diseases.

Historically, societies have often reacted to conflict and essential resource scarcity with xenophobia and seizure of others' resources. Global society may again be heading in this direction. The United States, Australia and parts of Europe have strengthened their border protection.[4] Several countries recently banned food exports in response to higher prices; other nations are buying arable land in developing countries, apparently to attain long-term food security for their citizens, but with less certain food access to populations who live in the supplying nations. Borders increasingly closed to people and goods would reduce the possibility of trade to compensate for regional resource scarcity or declining governance.

Addressing climate change-related conflict is an important and urgent issue, not just for global security, but for public health and medicine. Linking climate change, population health and conflict may help galvanise health workers to use their collective influence to promote the public goods of cooperation and energy transition, reducing the likelihood of these appalling consequences. The influence of the International Physicians for the Prevention of Nuclear War is an encouraging precedent.

Finally, framing the risk of climate change and conflict as a health issue may facilitate construal of this nexus as one faced by humanity and the planet as a whole, rather than as a zero-sum game in which nations and neighbours must compete. Towards this goal, enlightened health workers can cooperate with those in the military, from all nations, who seek to ensure that this century is not our final one.[30] The likelihood of reducing the risks associated with climate change will be markedly improved, if it is considered a mainstream issue and treated like any other threat to prosperity and wellbeing. Any strategy, be it for health or national security, is incomplete and flawed if it does not consider the impact of climate change.

Declarations

Competing interests: None declared

Funding: None declared

Ethical approval: Not applicable

Guarantor: DCB

Contributorship: The article is on the subject of DB's PhD thesis, during which he completed a systematic literature review of the topic. He has previously published on the socio-political effects of climate change on health. CB has published widely on the consequences of climate and other environmental change on health, with a focus on socially-mediated effects. NM spent 37 years in the Royal Navy where he served as the UK government's Climate and Energy Security Envoy, working for the Ministry of Defence, Foreign and Commonwealth Office and Department of Energy and Climate Change to address the security implications of a changing climate and the impact on resource availability. He later served as the Foreign Secretary's Interim Special Representative for Climate Change.

Acknowledgements: The authors thank the reviewer for his insightful suggestions on the structure and content of this article.

Provenance: Not commissioned; peer-reviewed by Hugh Montgomery

References

1. Watts N, Adger WN, Agnolucci P, Blackstock J, Byass P, Cai W, et al. Health and climate change: Policy responses to protect public health. *Lancet*. Epub ahead of print 22 June 2015.
2. Butler CD and Harley D. Primary, secondary and tertiary effects of eco-climatic change: the medical response. *Postgrad Med J* 2010; 86: 230–234.
3. Hsiang SM, Meng KC and Cane MA. Civil conflicts are associated with the global climate. *Nature* 2011; 476: 438–441.
4. Welzer H. *Climate Wars: why people will be killed in the twenty-first century*. Cambridge: Polity Press, 2012.
5. Kelley CP, Mohtadi S, Cane MA, Seager R and Kushnir Y. Climate change in the fertile crescent and implications of the recent Syrian drought. *Proc Natl Acad Sci* 2015; 112: 3241–3246.
6. Connolly MA, Gayer M, Ryan MJ, Salama P, Spiegel P and Heymann DL. Communicable diseases in complex emergencies: impact and challenges. *Lancet* 2004; 364: 1974–1983.
7. Leaning J and Guha-Sapir D. Natural disasters, armed conflict, and public health. *N Engl J Med* 2013; 369: 1836–1842.
8. Jarvis L, Montgomery H, Morisetti N and Gilmore I. Climate change, ill health, and conflict. *BMJ* 2011; 342: d1819.
9. Morisetti N. Climate change and resource security. *BMJ* 2012; 344: e1352.
10. McMichael AJ. Globalization, climate change, and human health. *N Engl J Med* 2013; 368: 1335–1343.
11. Bowles DC, Butler CD and Friel S. Climate change and health in Earth's future. *Earth's Future* 2014; 2: 60–67.

12. German Advisory Council on Global Change. *Climate change as a security risk*. London: Earthscan, 2007.
13. Mazo J. *Climate conflict: how global warming threatens security and what to do about it*. London: Routledge, the International Institute for Strategic Studies, 2010.
14. Kahl CH. *States, scarcity and civil strife in the developing world*. Princeton, NJ: Princeton University Press, 2006.
15. UK Ministry of Defence. *Global strategic trends – Out to 2045*. Westminster: UK Ministry of Defence, 2014.
16. Department of Defense. *Quadrennial defense review 2014*. Washington, DC: Department of Defense, 2014.
17. McMichael AJ. Prisoners of the proximate: loosening the constraints on epidemiology in an age of change. *Am J Epidemiol* 1999; 149: 887–897.
18. Williams A and Funk C. A westward extension of the warm pool leads to a westward extension of the Walker circulation, drying eastern Africa. *Clim Dyn* 2011; 37: 2417–2435.
19. Leaning J and Guha-Sapir D. Natural disasters, armed conflict, and public health. *N Engl J Med* 2013; 369: 1836–1842.
20. Miller KE and Rasmussen A. War exposure, daily stressors, and mental health in conflict and post-conflict settings: bridging the divide between trauma-focused and pyschosocial frameworks. *Social Sci Med* 2009; 70: 7–16.
21. Summerfield D. War and mental health: a brief overview. *BMJ* 2000; 321: 232–235.
22. Connolly MA, Gayer M, Ryan MJ, Salama P, Spiegel P and Heymann DL. Communicable diseases in complex emergencies: impact and challenges. *Lancet* 2004; 364: 1974–1983.
23. White G. *Climate change and migration: security and borders in a warming world*. Oxford: Oxford University Press, 2011.
24. Barnett J. *The meaning of environmental security: ecological politics and policy in the new security era*. London: Zed Books Ltd., 2001.
25. United Nations Environment Programme. *Sudan: post-conflict environmental assessment*. Nairobi: United Nations Environment Programme, 2007.
26. Johnstone S and Mazo J. Global warming and the Arab Spring. In: Werrell C and Femia F (eds) *The Arab Spring and climate change*. Washington, DC: Center for American Progress, 2013.
27. Gleick PH. Water, drought, climate change, and conflict in Syria. *Wea Clim Soc* 2014; 6: 331–340.
28. Lecocq B and Belalimat N. The Tuareg: between armed uprising and drought. *African Arguments*, 23 July 2012. See http://www.africanarguments.org/2012/02/28/the-tuareg-between-armed-uprising-and-drought-baz-lecocq-and-nadia-belalimat/.
29. Francis DJ. *The regional impact of the armed conflict and French intervention in Mali: Noref*. Oslo: Norwegian Peacebuilding Resource Centre, 2013.
30. Rees M. *Our final century*. London: William Heinemann, 2003.